HEWLETT PACKARD

HP 4952A Protocol Analyzer

Getting Started

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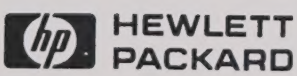

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Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, HP will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to the Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

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Contents

1: Learning the Controls

Before You Get Started 1-2
Line Voltage Selection 1-2
Grounding Requirements 1-2
Power Cord 1-2
Shipment 1-2
Transportation Disc 1-2
How To Use This Guide 1-3
Self-Demonstrations 1-3
Manual Conventions 1-3
Power Up and Power Down 1-4
Connecting the Pod 1-4
Turning the HP 4952A On 1-4
Turning the HP 4952A Off 1-4
Reset 1-4
Major Features 1-5
Monitoring 1-5
Simulation 1-5
Remote Testing 1-5
Asynchronous Terminal Emulation 1-5
Microfloppy Disc 1-5
Bit Error Rate Testing (BERT) 1-5
Printer and Video Output 1-5
The Front Panel 1-6
The Keyboard 1-6
Display 1-6
The Rear Panel 1-8
The Pod 1-10
The Top Level Menu 1-12

2: Summary Of Procedures

Procedures 2-2
Monitoring the Line 2-2
Monitoring the Buffer 2-3
Examine the Buffer 2-5
Mass Storage 2-5
Simulating 2-6
BERT 2-7
Terminal Emulator 2-8

3: Monitoring

Introduction To Monitoring 3-2
What Is Monitoring? 3-2
Monitoring the Line 3-2
Monitoring the Buffer 3-3
General Monitoring Procedure (line or buffer) 3-3
Hookup 3-3
Setup 3-3
Monitor Menu 3-3
Execution 3-3
Display 3-3
Monitoring Without the Monitor Menu 3-3
What the Monitor Menu Can Do For You 3-4
Entering a Monitor Program 3-4
How To Get Buffer Data For the Example 3-4
Hookup 3-4
Setup 3-4
Entering a Monitor Program 3-5
If You Have Trouble 3-5
Triggering -- How To Find Events 3-7
Adding a Beep 3-7
Counting Events 3-8
Run the Program 3-8
Timing Events 3-9
Run the Program 3-10
Comparing Cursor Timing With Program Timing. 3-10

4: Simulation

What Is Simulation? 4-2
Know Your System 4-2
Simulation Procedure 4-3
A Simulation Example 4-4
Simulation Puts Data In the Buffer 4-4
Hookup For the Example 4-4
Setup For the Example 4-5
Simulate Menu Entries For the Example 4-5
If You Have Trouble Entering the Program 4-6
Run the Program 4-7

5: Examine Data

Looking At the Buffer 5-2
Moving Around the Buffer 5-2
Character Decoding 5-2
Timer and Counter Display 5-2
Bit Shifting 5-2
Cursor Timing 5-2
Cursor Memory 5-3
Changing the Display Format 5-3

6: Disc Operations

Storing Menus and Data To Disc 6-2
Type Of Disc 6-2
Inserting the Disc 6-2
Procedure For Storing Files 6-3
Is the Disc Write Protected? 6-3
Loading Menus and Data From the Disc 6-5
Procedure 6-5

7: BERT

What Is BERT? 7-2
BERT Procedure 7-2
A BERT Example 7-4
Hookup 7-4
Setup 7-5
Execution 7-5
Injecting Errors 7-6
Setup Summary 7-6

8: Examples

Example 1: Measuring a Single RTS-CTS Delay 8-2
Example 2: Monitoring a DCE 8-3
Example 3: Monitoring a DTE 8-3
Example 4: FOX Message 8-4
Example 5: Counting Parity Errors 8-5

Figures

Figure 1-1. The Front Panel 1-7
Figure 1-2. The Rear Panel 1-9
Figure 1-3. The HP 18179 Interface Pod 1-11
Figure 1-4. The Top Level Menu 1-13

Figure 3-1. Hookup for monitoring the line 3-2

Figure 4-1. Simulation 4-2
Figure 4-2. Hooking up the Pod 4-4

Figure 5-1. Two Line Format 5-3
Figure 5-2. DTE Only 5-4
Figure 5-3. DCE Only 5-5
Figure 5-4. Data and State Format 5-6
Figure 5-5. Frame Format 5-7
Figure 5-6. Packt Format 5-8

Figure 6-1. Inserting the Disc 6-2
Figure 6-2. Write Protecting Your Disc 6-4

Figure 7-1. End-to-End Hookup 7-3
Figure 7-2. Loopback Hookup 7-4

Manufacturer's Declaration

The following certification (shown in German, followed by an English translation) applies only to products shipped into Germany after June 1, 1985.

Herstellerbescheinigung

Hiermit wird bescheinigt, daß das Gerät/System

HP 4952A Protocol Analyzer

in Übereinstimmung mit den Bestimmungen der Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Zusatzinformation für Meß- und Testgeräte

Werden Meß- und Testgeräte mit ungeschirmten Kabeln und/oder in offenen Meßaufbauten verwendet, so ist vom Betreiber sicherzustellen, daß die Funk-entstörbestimmungen unter Betriebsbedingungen an seiner Grundstücksgrenze eingehalten werden.

Manufacturer's Declaration

This is to certify that the equipment

HP 4952A Protocol Analyzer

is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation. The right to check this model type for compliance with these requirements was granted.

Additional Information for Test- and Measurement Equipment

Note If Test and Measurement Equipment is operated with unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the Radio Interference Limits are still met at the border of his premises.

Safety

Prior to operation of the equipment you must examine the instrument and review this document to ensure you are completely familiar with all the safety markings and the operating instructions.

Warnings

The following *WARNINGs* define operating procedures, practices, etc., which, *if not correctly followed*, could result in personal injury or loss of life.

WARNING

This product is a Safety Class 1 instrument with a protective earth terminal.

WARNING

For protection from electric shock hazard, power cord ground must not be defeated.

Safety

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings in this manual violates safety standards of design, manufacture, and intended use of this instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

Grounding
To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable compatible with an approved three-contact electrical outlet. The power jack and mating plug of the power cable must meet International Electrotechnical Commission (IEC) safety standards.

Environment
Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Service and Adjustment
Dangerous voltages exist within this instrument. Service and adjustment of this instrument is to be performed only by trained service personnel. Operating personnel are not authorized to remove the instrument covers or to perform any internal service or adjustment procedure.

Do not replace components with the power cable connected. Dangerous voltages may be present even when the power cable is disconnected.

Do not perform internal servicing or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

CRT Handling
Rough handling or jarring of the instrument can break the CRT (cathode ray tube). The resulting implosion will scatter glass fragments at a high velocity. Removal or installation of the CRT is to be performed only by qualified maintenance personnel using approved safety mask and gloves.

Unauthorized Service

The installation of substitute parts or the installation of any instrument modification not authorized by Hewlett-Packard is specifically forbidden. The performance of such unauthorized service can negate the instrument warranty or any maintenance agreements.

Return the instrument to a Hewlett-Packard Sales and Service Office for authorized service and repair.

Documentation Conventions

The following symbols, abbreviations, and other conventions are used in this publication.

Symbol	Definition
`Setup Menu`	A softkey.
RESET	A keyboard entry
[CNTL] character	A control character entry from the keyboard where *both* the **[CNTL]** (control) key and an alphanumeric key are pressed at the same time. To enter **[CNTL] U** press the control and the U character key.
[SHIFT] `Softkey`	A keyboard entry where *both* the **[SHIFT]** and a softkey are pressed at the same time to select an *auxiliary* softkey function.
BSC	Within menus or screens, a user-defined parameter.
Message	Error message or analyzer text display.

WARNING

An operating procedure, practice, etc., which, *if not correctly followed*, could result in personal injury or loss of life.

CAUTION

An operating procedure, practice, etc. which, *if not strictly observed*, could result in damage to, or destruction of, equipment or software.

NOTE

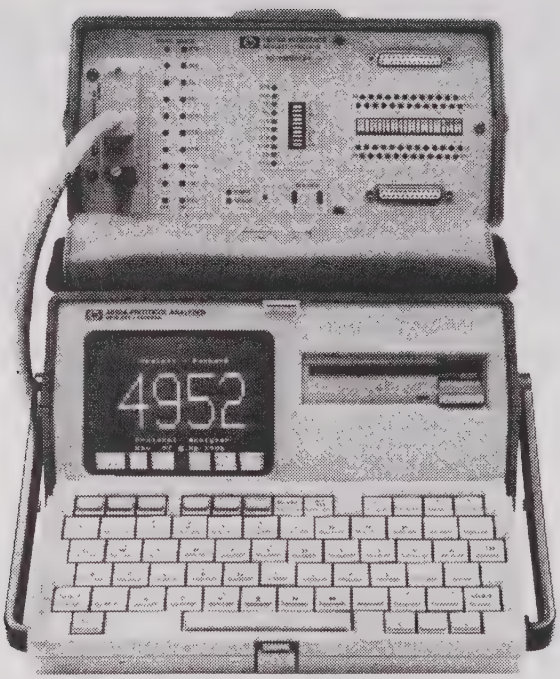
Explanatory comments or supplementary instructions are preceded by a *Note* label.

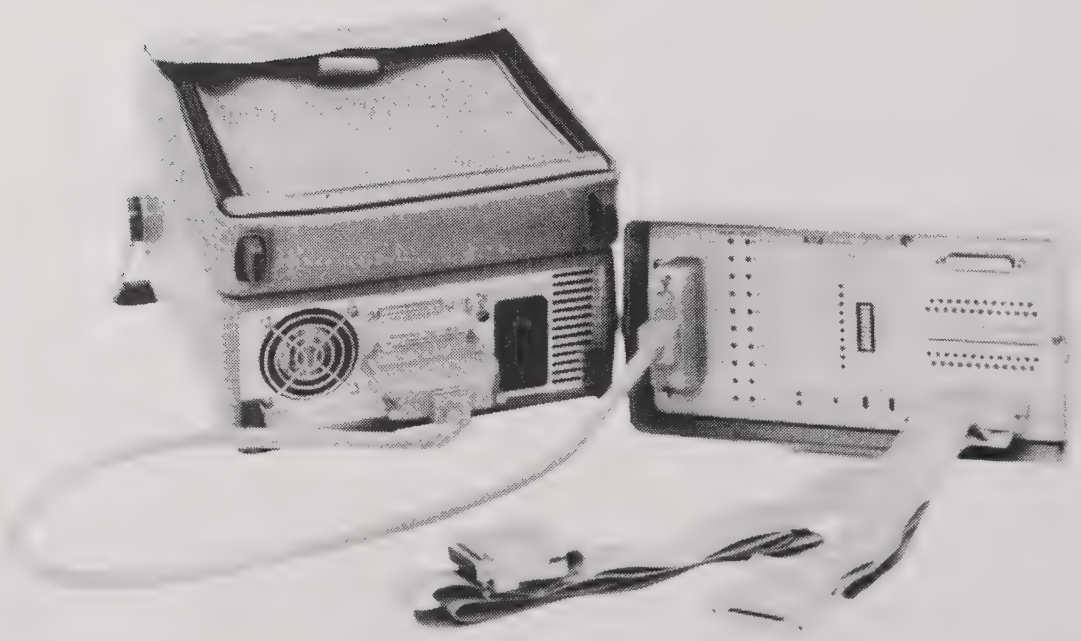
Printing History

New editions are complete revisions of the manual. Update packages (formerly known as "Manual Changes") are issued between editions. They contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update. The edition does not change when an update is incorporated.

Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correlation between product updates and manual updates.

Edition 1 ..... September 1988





The HP 4952A

1

Learning the Controls

- Before You Get Started
- How To Use This Manual
- Power Up and Power Down
- Major Features
- The Front Panel
- The Rear Panel
- The Pod
- The Top Level Menu

Before You Get Started

Inspect the analyzer and accessories for any physical damage sustained in transit. Ensure that you have received all the items that should accompany the analyzer. If accessories are missing or if the unit is received in a damaged condition, notify the nearest HP Sales and Support Office and file a claim with the carrier.

Line Voltage Selection

There is no line voltage selection: the HP 4952A may be connected to any AC power source between 90 to 264 volts; and 48 to 66 Hz. See the appendix in the main operating manual for exact tolerances.

Grounding Requirements

The HP 4952A is equipped with a three-conductor power cable which, when connected to an appropriate power outlet, grounds the analyzer. To preserve this protection, do not operate the analyzer from a line power outlet that has no ground protection.

Power Cord

The power cord packaged with each analyzer depends on its destination. The appendix in the main operating manual has a chart of power cord plugs matched to different areas. If the analyzer has the wrong power cord for the area, contact your HP Sales and Support Office.

Shipment

If your analyzer is being returned for service, contact the nearest HP Field Repair Center or Sales and Support office for complete shipping instructions.

Transportation Disc

Always transport the HP 4952A with the yellow plastic transportation disc installed.

How To Use This Guide

This "Getting Started" guide, which is summarized below, contains the basic information you need to begin using the HP 4952A. For more detailed descriptions, see the main operating manual.

Chapter 1 -- Learning the Controls. Descriptions of front and rear panel controls, pod, and Top Level Menu.

Chapter 2 -- Summary of Procedures. Short step-by-step descriptions of all the instrument functions.

Chapter 3 -- Monitoring. Explanation of monitoring with an optional self-demo.

Chapter 4 -- Simulating. Explanation of simulating with an optional self-demo.

Chapter 5 -- Examine Data. How to look at buffer data with the different display formats.

Chapter 6 -- Disc Operations. How to load and store menus and data from and to the disc.

Chapter 7 -- BERT. How to perform bit error rate tests.

Chapter 8 -- Examples. Simple monitor and simulate examples.

Self-Demonstrations

Chapters 3, 4, 5, and 7 contain optional self demonstrations which enable you to learn by doing. The self demonstrations in chapters 3, 4, and 5 require buffer data, which you can collect either by loading the DEMO_DATA file from the utility disc, or by performing the self demonstration in chapter 4 (simulating).

Manual Conventions

Softkeys (the labels at the bottom of the screen) are displayed in inverse video; for example: press **Setup** . Hardkeys (actual keyboard keys) are capitalized; for example: press MORE.

Power Up and Power Down

Connecting the Pod

The pod should always be installed or removed with the instrument power off.

To install the pod, connect the interface pod cable to the interface pod connector on the rear panel. Tighten the connector screws so the cable will not pull off during operation.

Turning the HP 4952A On

The HP 4952A may be connected to any AC power source between 90 to 264 volts; and 48 to 66 Hz. Connect the AC power cord to the HP 4952A power cord connector and then to the AC line connector. Set the power switch on the rear panel to the (1) position. If your instrument displays the Top Level Menu after power-on, you can be confident that most internal circuits are working properly.

Turning the HP 4952A Off

Set the power switch on the rear panel to the (0) position when the analyzer is in the Top Level Menu.

Caution To save current setups and data after turnoff, be sure to press EXIT and go to the Top Level Menu before turning off the instrument. Otherwise the analyzer may reset to default parameters when you turn it back on.

Reset

To clear the buffer and reset to default setup parameters, press **Reset** in the Top Level Menu, and then **Reset Menus** .

Major Features

The HP 4952A is a rugged portable protocol analyzer and BERT tester. A partial list of some of the features is given below:

Monitoring

The HP 4952A can monitor all major protocols and data codes on all common interfaces at speeds up to 64 kbits/sec (19.2 kbits/sec for asynchronous lines). Auto Configure automatically finds the protocol, speed, data code, and parity of most data communication links. The HP 4952A will look for up to 63 simultaneous events by triggering; then it can count the events or measure the time between them.

Simulation

You can substitute the instrument for any network component, and then exercise the other devices on the line.

Remote Testing

The HP 4952A has full unattended remote operation, which enables you to stay at the datacomm center and monitor a remote site.

Asynchronous Terminal Emulation

Terminal emulation eliminates the need to carry both an analyzer and a terminal.

Microfloppy Disc

The disc drive lets you store large amounts of data and setups.

Bit Error Rate Testing (BERT)

BERT evaluates the integrity of the entire datacomm link.

Printer and Video Output

You can connect a printer for hard copy of data and menus. You can connect a video monitor for a larger display.

The Front Panel

The Keyboard

Besides the full ASCII keyboard, the following keys have special actions:

Softkeys	The six dark gray keys directly under the display. The label of each key, shown at the bottom of the display, changes for each menu and field. Except when entering keyboard characters, use the softkeys to enter all parameter selections.
Cursor Keys	The four arrow keys which the cursor from field to field in each menu.
EXIT	Press EXIT to get the Top Level Menu, which accesses all other menus. During execution, EXIT is a halt key.
MORE	Press MORE to see more softkeys whenever the small vertical "more" appears on the lower-right corner of the display.
Shift	Selects lower-case characters when pressed with another key.
CNTL	Selects a control character (blue upper label on the keycaps) when pressed with another key. Unless you use hexadecimal or binary entry, this is the only way to access control characters (i.e., you must press CNTL SYN; you cannot type SYN to get sync characters).
RTN	Moves the cursor to the next lower field (same as cursor down).

Display

The 5 inch display shows 16 lines of 32 characters. Softkey labels occupy the bottom two lines.

Figure 1-1. The Front Panel

The Rear Panel

Line Switch	Press the left side (1) of the line switch to turn the instrument on. Press the right side (0) of the line switch to turn the instrument off. You can connect the instrument to any AC line voltage from 90 to 264 volts; and 48 to 66 Hz.
Remote/Printer	Remote Mode. Use this connector to hook up the HP 4952A for remote operation as a slave or controller. Printer. This connector is also used to connect an ASCII printer for printing menus and data.
Interface Pod	Use this connector to hook up the interface pod.
Ext Video	Use this connector to hook up an external video monitor. The video output follows RS-170 conventions.
Fuse Holder	Open the line switch module from the top to replace the fuse.

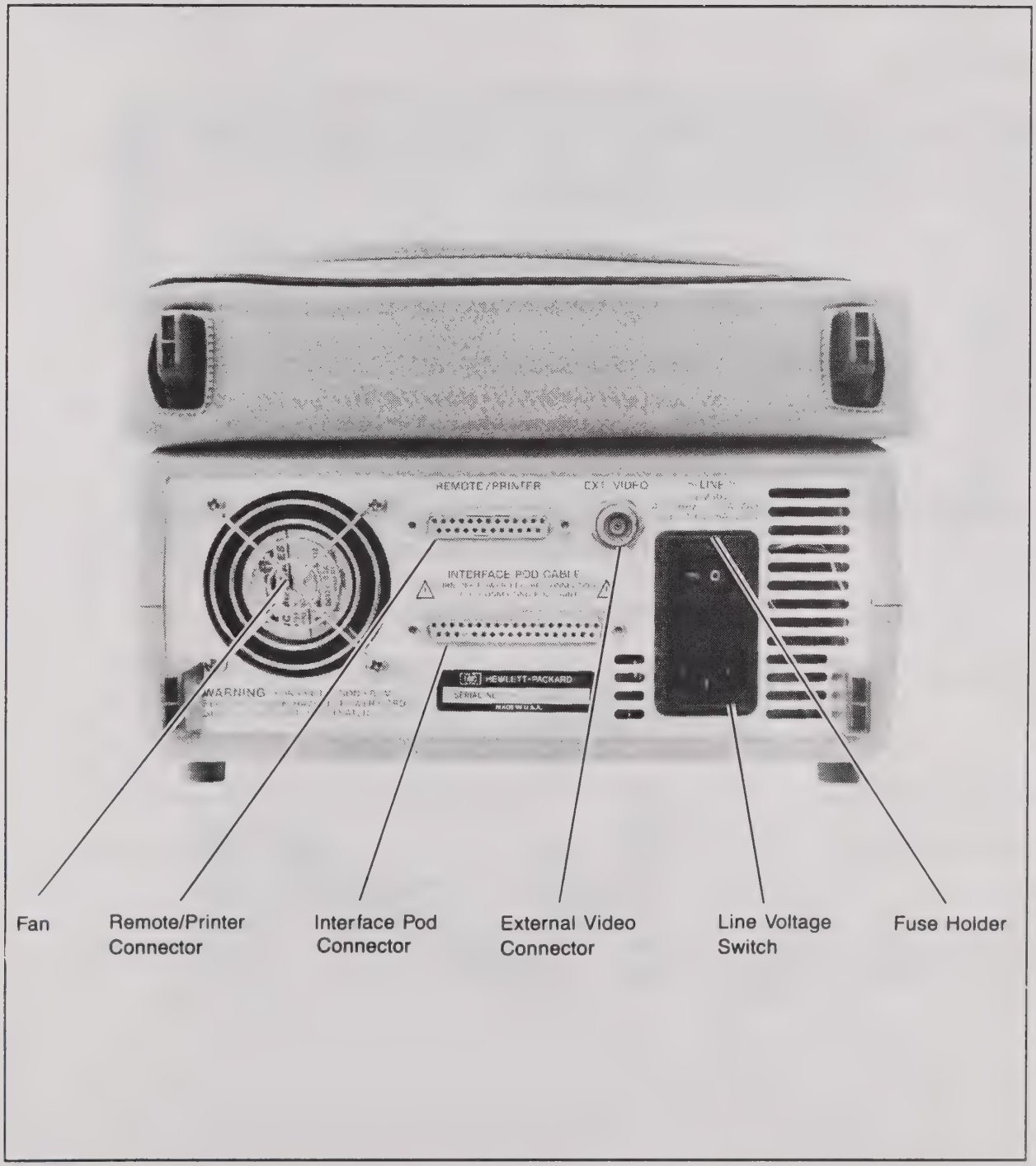


Figure 1-2. The Rear Panel

The Pod

The HP 4952A can be used with several different interface specifications (see the main manual). Each interface requires a different pod. The HP 18179A interface pod, which is used on RS-232C/V.24 interfaces is illustrated here.

LEDs	The LEDs on the left side of the pod how 3-state activity on the interface pins. The high impedance state is indicated when both the green and the red LED are off.
Disconnect Switches	Pins 2, 3, 4, 5, 6, 8, 15, 20, and 24 can be individually disconnected from the data link by switches. This lets you isolate non-driven lines which can cause cross-talk and noise.
RS-232C/V.24 Connectors	For connecting the pod to the line. include the breakout box portion of the pod in series, connect the Y-cable to the top connector. To by-pass the breakout box, connect the Y-cable to the bottom connector.
Breakout Box	Provides cross-patching, line-forcing, and monitoring capabilities for all RS-232C/V.24 lines. The miniature switches isolate lines. The jumper pins allow patching.
Mark/Space Indicator	To find the state of any pin, jumper it to this indicator.
+/-12 V Source Pins	Supply +12 and -12 volts. You may set any signal line on or off by jumpering that line to the source pins.
Instrument Connector	Connects the pod to the HP 4952A via the interface pod cable.

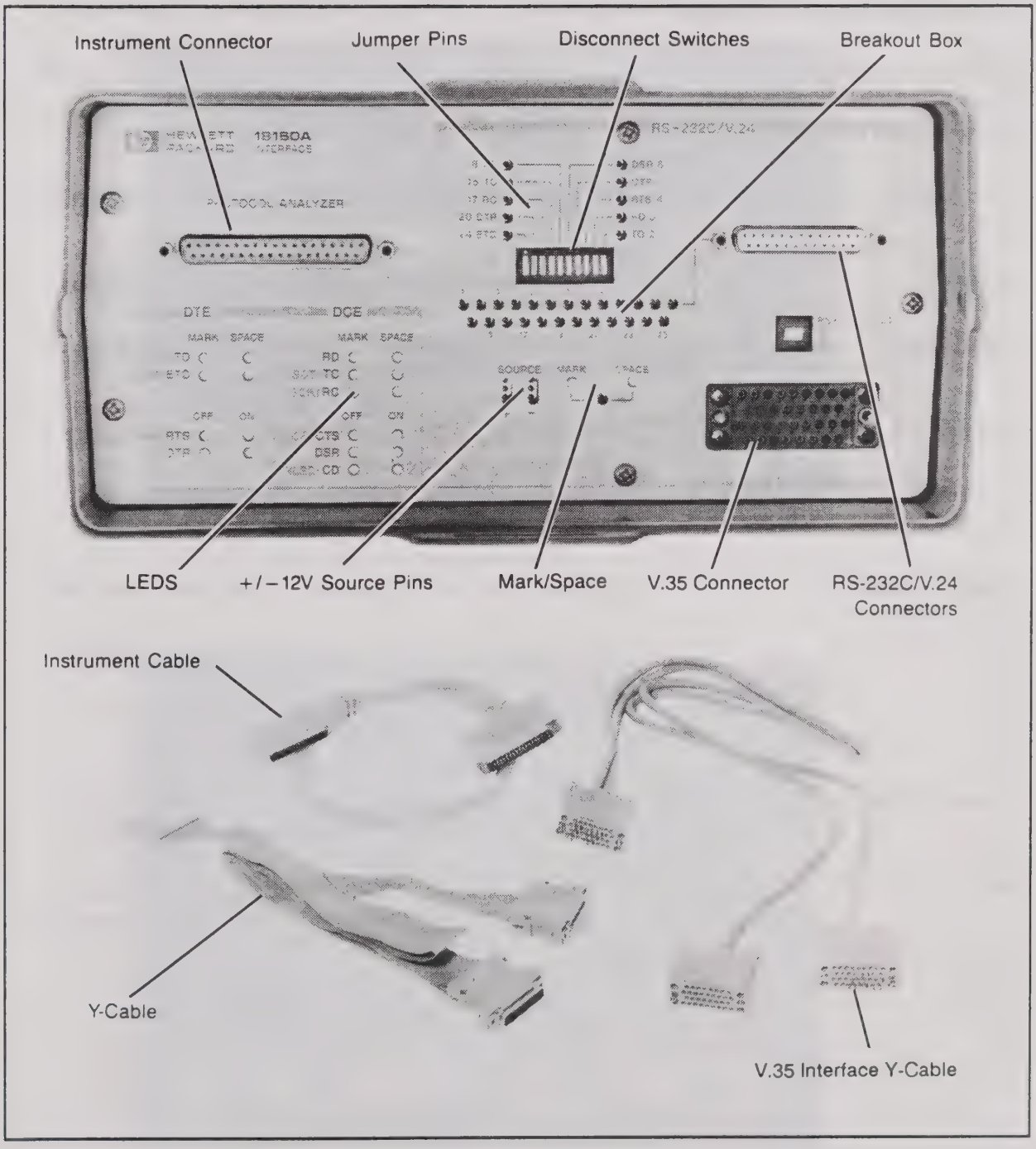


Figure 1-3. The HP 18179 Interface Pod

The Top Level Menu

The Top Level Menu accesses all instrument functions. Press EXIT once or twice to get the Top Level Menu. Press MORE to see all the top level softkeys. The menus accessed by softkeys from the Top Level Menu are described below.

Auto Confg	Press this softkey to automatically configure the HP 4952A to line parameters.
Setup	Use this menu to manually configure to line parameters.
Mon Menu	Use the monitor menu to select triggers and make measurements. It is optional for monitoring.
Sim Menu	Use the simulate menu to send data and set leads when simulating. Select triggers and measurements.
Run Menu	Executes all tests: monitoring, simulation, and BERT.
Examine Data	In this menu you can look at data in the buffer or on disc.
Reset	Reset all menus to their default conditions and clears the buffer.
Bert	Configures the analyzer for bit error rate tests.
Remote/Print	Configures the analyzer as a controller or slave for remote testing. Or configures the analyzer to an ASCII printer.
Mass Store	Load menus and data from the disc (and RAM option 002). Store menus and data to disc (and RAM with option 002).
Self Test	Perform self-test procedures in this menu.

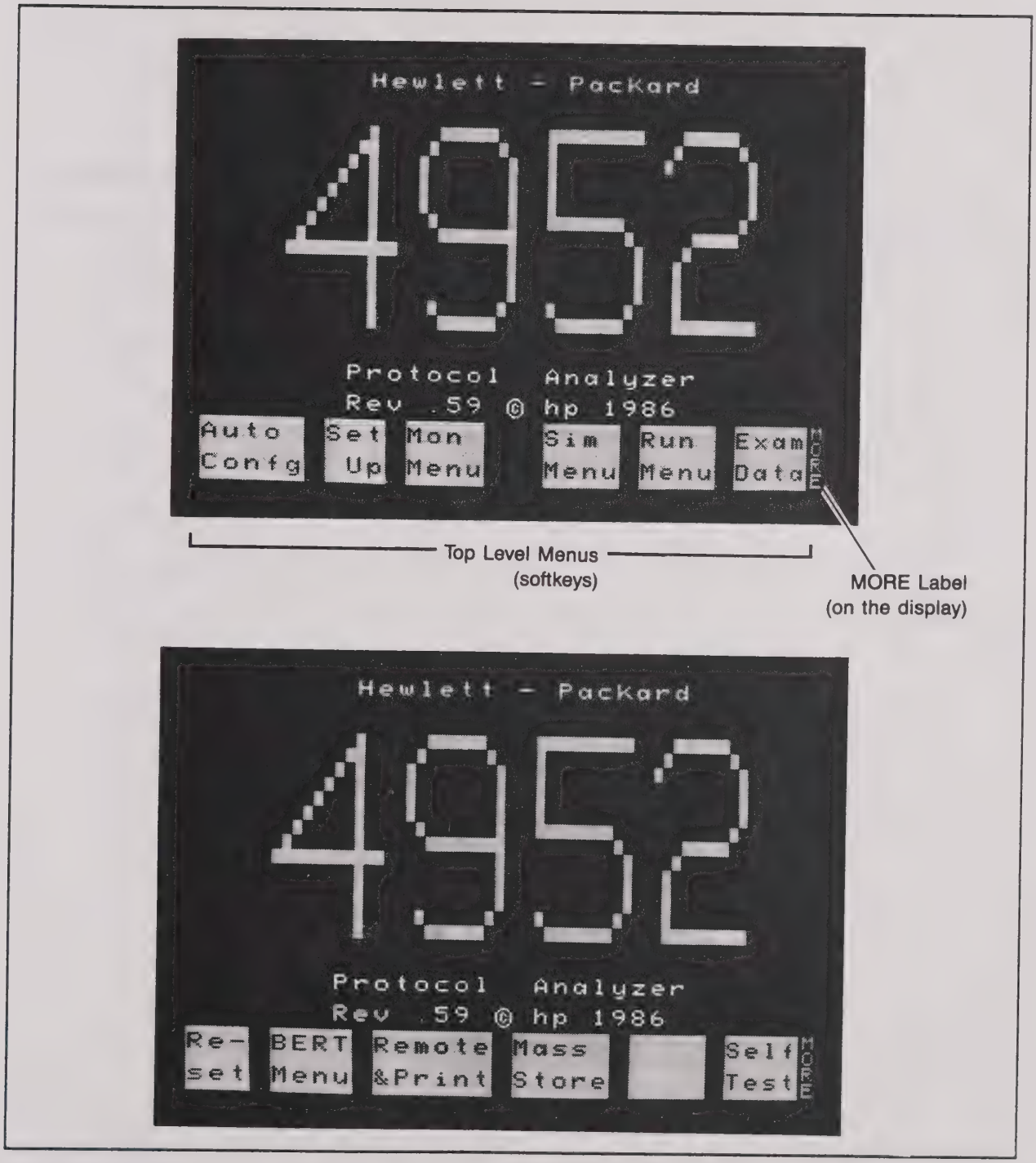
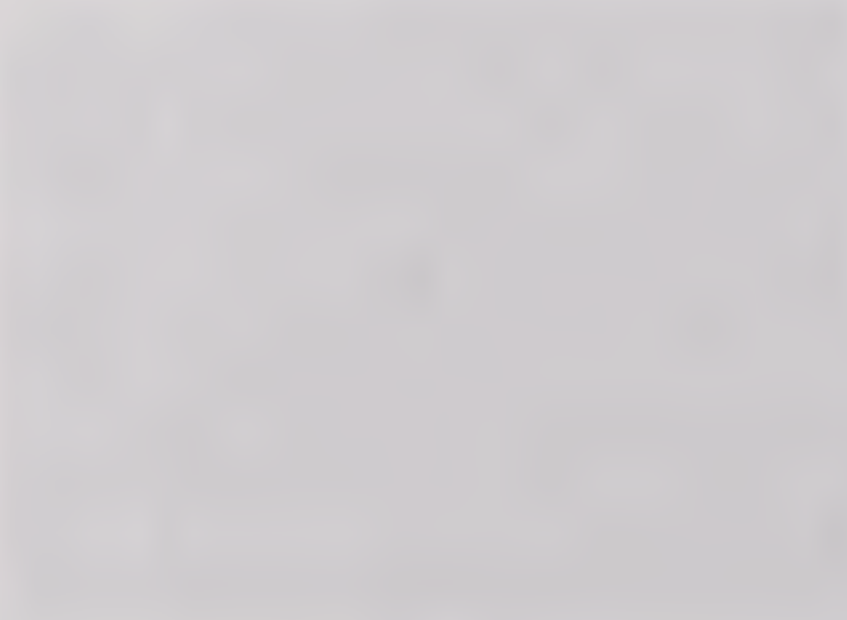


Figure 1-4. The Top Level Menu



2

Summary Of Procedures

- Monitoring the Line
- Monitoring the Buffer
- Using the Monitoring Menu
- Examine the Buffer
- Mass Storage
- Simulating
- BERT
- Remote
- Terminal Emulator
- Printing

Procedures

Most HP 4952A functions are summarized below. Remember that all menus are accessed from the level menu, which is accessed by pressing EXIT. Softkeys are denoted in inverse video ■ .

Monitoring the Line

"Monitoring" means to "look at". Looking at the data passing between the DTE and DCE is the most common use for a protocol analyzer. (DTE stands for "Data Terminal Equipment" and DCE stands for "Data Circuit Terminating Equipment").

- HOOKUP. Turn off the analyzer and connect it to the pod. Connect the Y-cable to the pod. Connect one branch of the Y-cable to the DTE, and the other branch to the DCE.

- SETUP. Press **Auto Confg** to have the analyzer automatically configure to the line parameters. Press **Setup** to manually configure the analyzer to your line. If you don't set the analyzer to the correct line parameters, the data will be either absent or incorrectly decoded.

  AUTO CONFIGURE. For automatic setup, use Auto Configure to find all or most of the line parameters. Press **Auto Confg** in the Top Level Menu: the analyzer briefly shows the line parameters and begins monitoring. If some of the parameters are obviously incorrect, or the data looks wrong, press EXIT and then **Setup** to enter the proper parameters.

- MONITOR MENU. You can, optionally, enter monitor measurements and triggers in the monitor menu. Press **Mon Menu** in the Top Level Menu and use the softkeys to enter the instructions. If you don't want to enter any measurements, go right from setup to execution.

- EXECUTION. Execute by pressing **Run Menu** and then **Monitor Line** . The data should scroll across the screen. If it does not, or appears garbled, check the setup again.

Monitoring the Buffer

The HP 4952A's 32 Kbyte (3/4 Mbyte with option 002) memory is called the "buffer". The HP 4952A can "monitor the buffer", which means that it can post-process previously captured data. Monitoring the buffer is like monitoring the line, except that you are analyzing previously collected data; so you don't need to connect the instrument to the system.

- COLLECT BUFFER DATA. You need buffer data in order to monitor the buffer. Buffer data can be collected by monitoring or simulating on-line, or by loading a data file from disc. The buffer is continuously filled when monitoring or simulating on-line.

- SETUP. Press **Setup** and configure the analyzer to the same line parameters that were originally used to capture the data. If you got your data by loading a "menus and data" file type from the disc, the setup menu should already be correct. You cannot auto-configure to the data in the buffer, but if a "menu & data" file type was originally stored, the setup was stored with the data.

- MONITOR MENU. This step is optional: if you don't want to enter any measurements or triggers in the monitor menu, go directly from setup to execution.

  To enter monitor instructions, press **Mon Menu** in the Top Level Menu and use the softkeys to enter the instructions.

  Although you don't need to use the monitor menu for monitoring the line or the buffer, it can be especially useful for making measurements and analyzing data. When monitoring the line, you can catch events that you might otherwise miss. When monitoring the buffer, you can post-process the same data repeatedly in different ways.

- EXECUTION. To execute, press **Run Menu** , and then **Monitor Buffer** .

You don't have to use the monitor menu if you just want to watch the data on the line; but the monitor menu allows you to perform triggering and other measurements. Some of the things you can do in the monitor menu are summarized below:

- TRIGGERING. Triggering enables you to find events in the data stream and provides a point of reference for timing and other measurements. In the monitor menu press **When Trig** and select the type of event (DTE or DCE characters, lead changes, errors, timeouts, or softkey presses).

- HIGHLIGHTING AND BEEPING. You can highlight trigger events in the buffer. Or you can have the analyzer notify you when t finds a trigger event. Press **When Trig** and select the type of event. Then, in the next block, press **Highlight** or **Beep** . To do both, press **Highlight** , **and then** , and **Beep** .

- TIMING. Enter a "when" trigger statement to identify the event at which you want the measurement to start. Then press **Start** and **Timer** . Enter another "when" trigger statement to identify the event at which you want the measurement to stop. Then press **Stop** and **Timer** . Note that the "when" statements must precede the start and stop timer statements to provide a point of reference.

- COUNTING. Press **Inc Ctr** . Select the counter number and the increment value.

- CONDITIONAL BRANCHING. Press **If** and then either **Counter** or **Lead** . If you select **Lead** , a "when" trigger statement must appear earlier in the program to provide a point in the data stream at which the lead condition is tested.

Examine the Buffer

The HP 4952's 32 Kbyte (3/4 Mbyte with option 002) memory is called the "buffer". The analyzer collects data in the buffer as it monitors or simulates on-line. You can also load data into the buffer from the disc. The examine data menu lets you scroll through the data in the buffer.

- LOOKING AT THE DATA. Press **Exam Data** in the Top Level Menu. The display shows the contents of the buffer. Use the **Roll Up/Down** and **Next/Prev Page** softkeys to move around the buffer.

- CHANGING THE DISPLAY. To change the display format, press **Chang Dsply** and select the desired display format from the softkeys.

- CURSOR TIMING. You can measure the time between events appearing in the buffer. Move the cursor to the character or event at which you want to begin the measurement and press MORE, then **Start Time** . Move the cursor to the character or event at which you want to end the measurement and press **End Time** . The time interval between characters is shown at the top of the display.

Mass Storage

The mass store menu enables you to load menus and/or data from the disc, or store menus and/or data to the disc.

- LOADING. Insert the disc, and press **Dir** to see the directory. Move the cursor over the file to be loaded. Press **Load** , and then **Execute** .

- STORING. Insert the disc. For new discs, press **Format** to format the disc. Press **Store** , and type in the file name and file type. Press **Execute** .

- SELECTIVE STORING. "Start disc" and "stop disc" statements in the monitor and simulate menus let you store only data of interest.

Simulating

The analyzer can be substituted for either a DTE or DCE so you can send characters and set leads, and thus test the other devices on the line.

- HOOKUP. Disconnect the device to be simulated. Connect the analyzer in its place through the pod and one branch of the Y-cable.

- SETUP. Use the setup menu to configure the analyzer to the correct line parameters.

- SIMULATE MENU. You must use the simulate menu to tell the analyzer whether it is simulating a DTE or DCE. The simulate menu is also where you tell the analyzer to send characters and set leads.

  SELECT DTE/DCE. In the simulate menu select **DTE** or **DCE** to tell the analyzer on which leads to transmit and receive.

  SEND. Use **Send** to transmit characters to other devices on the line.

  SET LEADS. Use **Set Lead** to turn leads on or off for correct handshaking between devices on the line. Unless lead handshaking is correct, the other devices may not respond.

  MONITORING MEASUREMENTS. The simulate menu contains the same triggering, timing, counting, and other monitoring features as the monitor menu.

- EXECUTION. You must execute from the run menu.Press **Run Menu** in the Top Level Menu, and then **Simulate** .

BERT

Bit Error Rate Tests (BERT) measure digital noise; how often "highs" are incorrectly changed to "lows", and vice versa. Thus, you can measure the integrity of the digital link.

- HOOKUP. For end-to-end testing, substitute an analyzer for the DTE at each end of the line. For loopback testing, substitute the analyzer for only one DTE and "loop back" the modem or terminal at the other end of the line.

- SETUP. In each analyzer, press **BERT** in the Top Level Menu, and select the correct setup parameters. For synchronous systems, select "Ext" for bits/sec, and "None" for framing.

- EXECUTION. Select **Run Menu** in the Top Level Menu of each instrument and press **BERT** .

The HP 4952A can remotely control or be controlled by another HP protocol analyzer.

- HOOKUP.Use the "Remote/Printer" connector on the rear panel to connect each analyzer to the modem.

- SLAVE. On the slave analyzer, select **Slave** in the remote menu and enter the slave address and bits/sec. Optionally, you can type modem commands in the "modem string" field (e.g., dial sequences), and then press **Send Strng** .

- CONTROLLER. On the controller analyzer, press **Control** in the remote menu and enter the bits/sec. Optionally,type modem commands in the "modem string" field (e.g., dial sequences), and press **Send Strng** .

- OPERATION.On the controller select **ID Slave** for the first operation, and press **Execute** . Then select and execute any other "operation".

Terminal Emulator

You can use the analyzer as an asynchronous terminal by loading the application from the HP 4952A Utility Disc.

- LOAD THE APPLICATION. Insert the utility disc. Press MORE, and then press **Mass Store** . Move the cursor to the file name VT100. Press **Load** , and then press **Execute** .

- SETUP. From the Top Level Menu, press MORE, then **Terminal** . Now press **Setup Menu** , and select the proper parameters for your installation. Press EXIT when setup is complete.

- EXECUTION. Press **Execute** in the Terminal Emulation Menu to cause the analyzer to go into the terminal mode. Press EXIT twice to leave terminal mode.

Printing

You can print most HP 4952A displays to an ASCII printer such as the HP 2225D ThinkJet.

- HOOKUP. Connect the ASCII printer to the Remote/Printer connector on the rear panel.

- SETUP. Select **Remote & Print** in the Top Level Menu, and then **Print Setup** . Make the correct settings for your ASCII printer.

- EXECUTE. You can print from any menu that has a **Print** softkey.

3

Monitoring

- Introduction To Monitoring
- Entering a Monitor Program
- Triggering -- How To Find Events
- Counting Events
- Timing Events

Introduction To Monitoring

What Is Monitoring?

"Monitor" means "to look at". When you monitor a data link, you look at the data passing on the link. The HP 4952A makes it easy for you to look at the passing data with several different display formats. The HP 4952A can monitor the line, or it can perform post-processing on already-collected data by monitoring the buffer.

Monitoring the Line

To monitor the line, connect the analyzer to the pod; then, using the Y-cable, connect the pod into the line as shown below. Then perform the monitoring procedure described below.

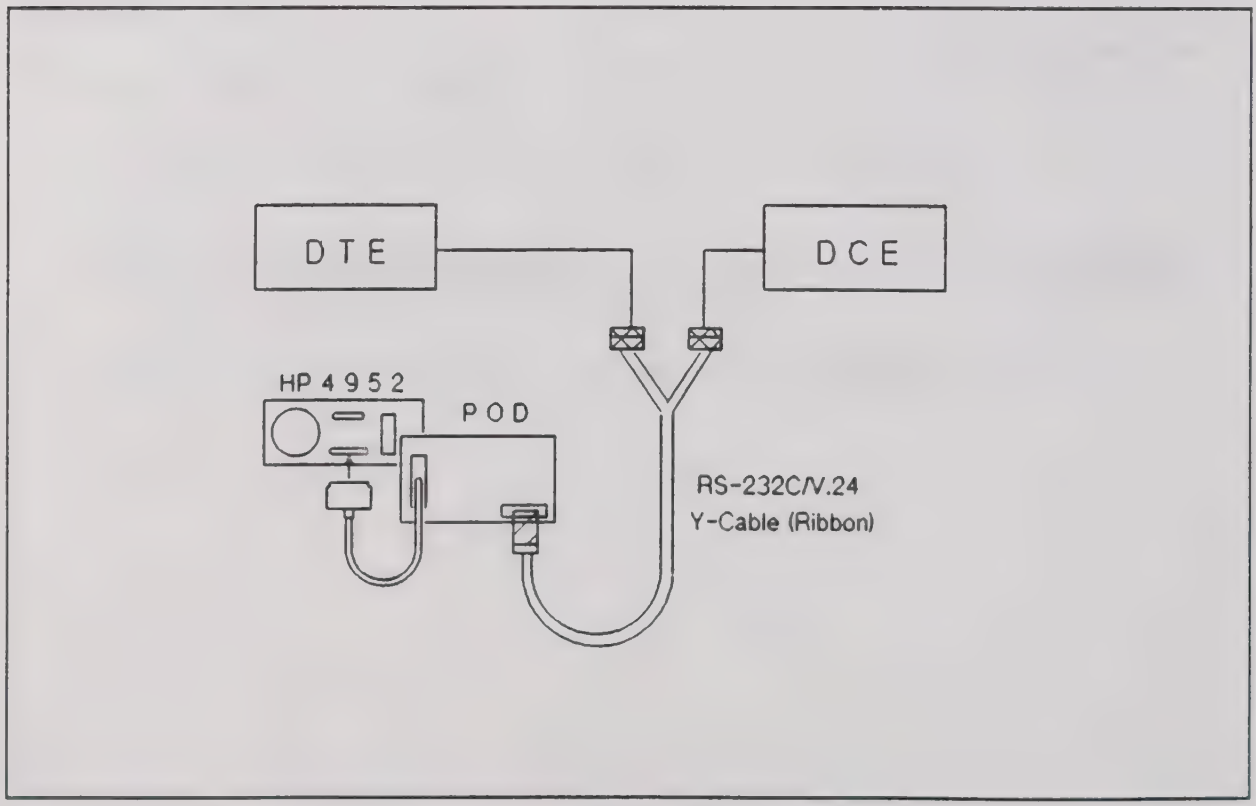


Figure 3-1. Hookup for monitoring the line

Monitoring the Buffer

Monitoring the buffer requires no external hookup. However, you must have buffer data. Buffer data is acquired by monitoring the line, by simulating, or by loading from the disc. Monitoring the buffer is just like monitoring the line: the data in the buffer scrolls past on the screen.

General Monitoring Procedure (line or buffer)

Hookup

To monitor the line connect the analyzer through the pod into the line as described on the preceding page. Monitoring the buffer requires no hookup.

Setup

To monitor the line, press **Auto Confg** for automatic setup; or press **Setup** and enter the correct line parameters in the setup menu. To monitor the buffer, you must use the setup menu.

Monitor Menu

This step is optional. If you want the analyzer to make measurements or find events for you, press **Mon Menu** in the Top Level Menu and enter the monitoring instructions. If you don't want to use the monitor menu, go right to the run menu, as described below.

Execution

Press **Run Menu** in the Top Level Menu, and then **Monitor Line** , or **Monitor Buffer** if you have data in the buffer. The data should start scrolling past. If it does not, check setup.

Display

To change the display format go to the setup menu and changing the "display" field.

Monitoring Without the Monitor Menu

If you just want to watch the data scrolling past, then after setup, go right to the run menu.

What the Monitor Menu Can Do For You

You don't need to use the monitor menu to monitor; you can just go to the run menu and press **Monitor Line** or **Monitor Buffer** . However, it's not very useful to watch data scrolling past. Usually, it's moving too fast for you to be able to see much. The monitor menu can find events for you in the data stream; it can count events; it can time events; and it can selectively save events on disc.

Entering a Monitor Program

The following pages describe some of the features of the monitor menu. You can perform the example if you have an HP 4952A and some data in the buffer.

How To Get Buffer Data For the Example

To run this program you will need data in the buffer. You can get the buffer data by loading DEMO_DATA file from the utility disc, or by performing the exercise in the simulate chapter. See the "Mass Store" or "Simulate" chapters.

Hookup

In the following example, you will be monitoring the buffer; so the analyzer does not need to be connected to the pod.

Setup

Press **Setup** in the Top Level Menu. Enter the following parameters. Use the cursor keys to move from field to field. If you have loaded the file DEMO_DATA, the setup will be correct.

```
Protocol:   X.25              Display:    D & S
Code:       ASCII 8
Bits/sec:   1200              Err chk:    CCITT
Parity:     None
                              DTE clock:  DCE
Mode:       Sync
                              Bit sense:  Norm
```

Entering a Monitor Program

Press **Mon Menu** in the Top Level Menu and enter the following program.

```
Block 1                          Tell the analyze to trigger on any "F" which
When DCE F                       appears on the DCE channel.
then goto Block 2

Block 2                          Mark the event in the buffer,  and then do it
Highlight                        again.
   and then
Goto Block 1
```

If You Have Trouble

If you have trouble entering the monitor program, here is the procedure. The program is easily entered with softkeys. Remember, the softkeys change according to the position of the cursor.

1. With the cursor in block 1 of the monitor menu, press **When Trig** .

   ```
   Block 1
   When
   ```

2. Press **DCE** , and type "F". Use the cursor keys to move the cursor down to block 2, or press RTN twice.

   ```
   Block 1
   When DCE F
      then goto Block 2

   Block 2
   ```

3. Press MORE until you see the **Highlight** softkey, and press it. Press **and then** .

```
Block 1
When DCE F
   then goto Block 2

Block 2
Highlight
   and then
```

4. Press MORE until you see the **Goto Blk** key, and press it.

```
Block 1
When DCE F
   then goto Block 2

Block 2
Highlight
   and then
Goto Block 1
```

Run the Program

After entering the monitor program, press **Run Menu** in the Top Level Menu, and then **Monitor Buffer** . The data in the buffer will scroll past with all the F's highlighted in half bright.

Triggering -- How To Find Events

Note the "when" command in block 1 of your monitor program:

```
When DCE F
   then goto Block 2
```

This statement tells the analyzer to trigger on (look for) the character "F" in the data stream.

Triggers are events that you want the analyzer to look for. Triggers are specified by "when" statements. After entering a "when" trigger statement to identify an event, you can then tell the analyzer to highlight, beep, start or stop a timer when it finds that event. Triggers provide a point of reference. Almost all measurements are done with triggers!

Adding a Beep

Let's tell the analyzer to beep, as well as highlight, whenever it finds an "F". In your monitor program, move the cursor to the beginning of the "Goto Block 1" statement. Press MORE until you see the **Insert Line** softkey, and press it. Press MORE and then **Beep** . The program should look like the following. Run the program from the run menu and listen to the beeps.

```
Block 1                          Tell the analyzer to trigger on any "F" which
When DCE F                       appears on the DCE channel.
   then goto Block 2

Block 2                          Mark the event in the buffer, beep, and then do
Highlight                        it all again.
   and then
Beep
   and then
Goto Block 1
```

Counting Events

By adding one more command to your monitor program, you can count the number of F's.

In the monitor menu, move the cursor down to the beginning of the last line "Goto Block 1". Press MORE until you see the softkey **Insert Line**, and press it. Press **Inc Ctr**. The program should look like this:

```
Monitor

Block 1                              Tell the analyze to trigger on any "F" which
When DCE F                           appears on the DCE channel.
   then goto Block 2

Block 2                              Mark the event in the buffer, beep, count it, and
Highlight                            then do it all again.
   and then
Beep
   and then
Increment Counter 1 by 1
   and then
Goto Block 1
```

Run the Program

From the Top Level Menu, go to the run menu and press **Monitor Buffer**. The data again scrolls past. If you're fast enough, you can press **Summary** and watch counter 1 change. If you missed it, go to the examine data menu and press **Timer & Cntr**. The value of counter 1 will depend on how long the original simulate program ran; that is, how many "F's" are in the buffer.

Timing Events

If you already have data in the buffer, you can measure the time between events by using cursor timing, as described previously in the "Examine Data" section. If you're monitoring on-line, and you don't know when an event will occur, you can use the triggers and timers in the monitor menu. To illustrate, let's measure the time between the "A" and the "G" in our character string.

Delete the previous program by going to the monitor menu, moving the cursor to the beginning of any line, and pressing MORE until you see the **Delete Prg** softkey. When you press **Delete Prg**, a message appears "Press to Confirm". You must then press **Delete Prg** again to delete the program. Now enter the following program:

```
Monitor

Block 1                          Tell the analyzer to look for an "A".  NOTE:  The
When DCE A                       "when" statement must appear before the "start
   then goto Block 2             timer" statement.

Block 2                          After finding the "A",  start the timer.
Start timer 1

When DCE G
   then goto Block 3             Now tell the analyzer to look for a "G".  NOTE:
                                 the "when" statement must appear before the "stop
                                 timer" statement.

Block 3                          After finding the "G", stop the timer.
Stop timer 1
```

Note "Start" and "stop" timer statements must be tied to a preceding "when" statement. "When" statements must appear first. You cannot say "start timer when ...." You must always say "when ... start timer".

Run the Program

Go to the run menu and press **Monitor Buffer** . When the data finishes scrolling past, go to the examine data menu and press **Timer & Cntr** . Timer 1 should measure 52 milliseconds +-2%.

Comparing Cursor Timing With Program Timing.

You cannot use cursor timing during run-time, but you can use cursor timing if the data is already in the buffer. Let's see how cursor timing compares with the timer program:

In the examine data menu, move the cursor over "A" and press **Start Time** . Then move the cursor over "G" and press **Stop Time** . At the top of the display, TIME = 52.0 milliseconds +- 2%.

4

Simulation

- What Is Simulation?
- Simulation Procedure
- A Simulation Example

What Is Simulation?

During simulation the HP 4952A is substituted for one of the devices on the data link. To connect the analyzer for simulation, disconnect the device to be simulated, and substitute the HP 4952A.

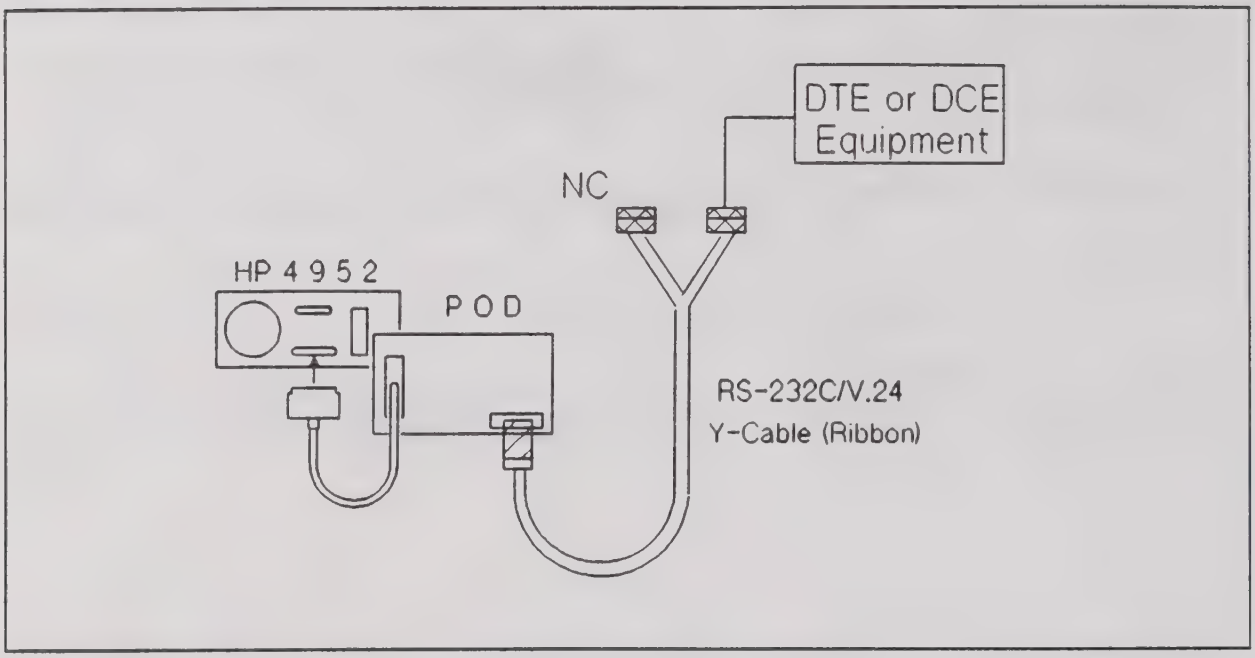


Figure 4-1. Simulation

Know Your System

Although the simulate menu is similar to the monitor menu, with some additions, simulating is really very different. You must know your system in order to simulate. When you insert the analyzer into the data link, you must know what the other link devices expect.

Some of the questions you must answer are: Are you simulating a DTE or a DCE? Is the DTE or the DCE supplying the DTE clock? What is the protocol, data code, bits/sec used on your line? What kind of lead handshaking is expected by the other devices on the line?

Simulation Procedure

The following is a summary of the simulation procedure.

1. HOOKUP. Turn off the analyzer and connect it to the pod.Connect the Y-cable to the pod and use one branch to substitute the analyzer for the device to be simulated.

2. SETUP. Press **Setup** in the Top Level Menu and enter the parameters for the line to be simulated. If the setup parameters are incorrect, the other devices on the line may not respond.

3. You must select either DTE or DCE for the device being simulated; if this selection is wrong the analyzer will send and receive on the wrong interface leads. You must also use the **Set Lead** command to set the correct leads on and off at the correct times to provide proper handshaking with the other devices on the line.

4. EXECUTION. Press **Run Menu** in the Top Level Menu, and then **Simulate**. The line data should start scrolling past. If it does not, check the connection, the setup, and the simulate menus.

A Simulation Example

The following example shows how to perform simulation. It is self-contained and does not require the analyzer to be connected to the line.

Simulation Puts Data In the Buffer

The HP 4952A simulates by sending characters to the pod. And because characters passing through the pod are monitored and captured in the buffer, data is always collected by simulating with the pod connected. In effect, the characters you send out are looped back.

Some exercises in the other chapters of this guide require buffer data. You can get the data either by loading the DEMO_DATA file on the utility disc, or by executing the following simulate example.

Hookup For the Example

To perform the following example, connect the analyzer to the pod as shown below.

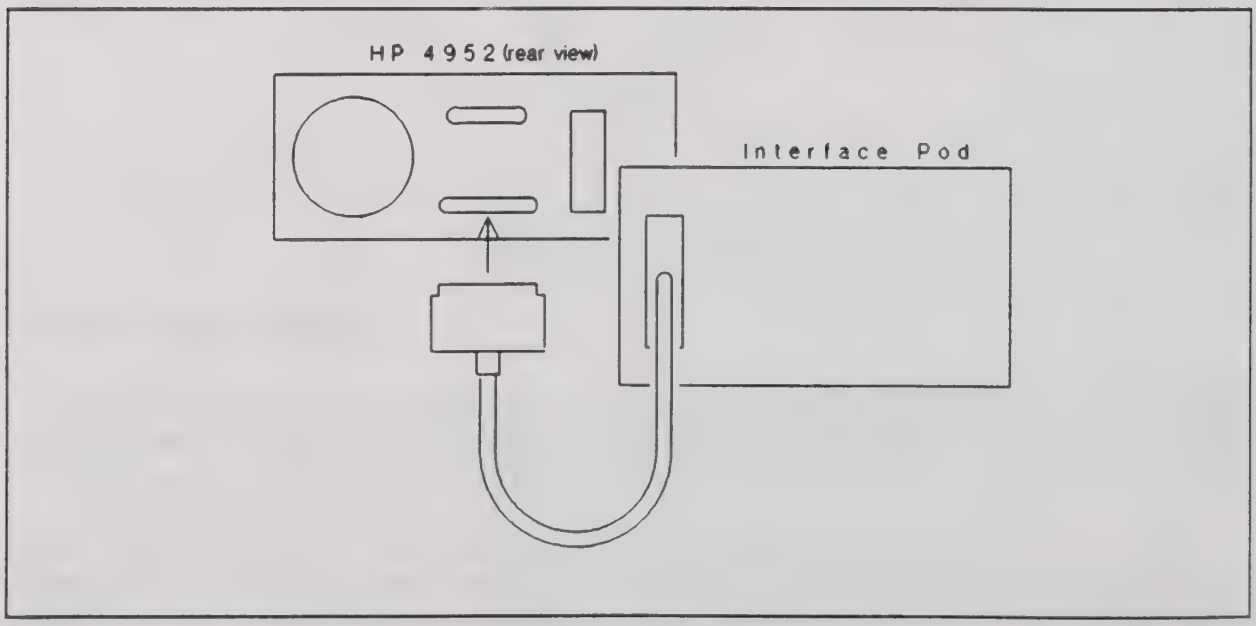


Figure 4-2. Hooking up the Pod

Setup For the Example

Press **Setup** in the Top Level Menu. Enter the following parameters. Use the cursor keys to move from field to field.

Protocol:	X.25	Display:	D & S
Code:	ASCII 8		
Bits/sec:	1200	Err chk:	CCITT
Parity:	None		
		DTE clock:	DCE
Mode:	Sync		
		Bit sense:	Norm

Simulate Menu Entries For the Example

If you load the sample file DEMO_DATA, skip the next step.

Press the **Sim Menu** softkey in the Top Level Menu and enter the following commands. If you have trouble, see the procedure on the next page. In the example below, "|" denotes a flag, and "GG" denotes a good frame check sequence; these are entered automatically in protocols such as X.25 and SDLC.

Use the softkeys to make entries in the simulate menu. Use the cursor keys to move to different fields. Press MORE to see other softkeys whenever the small vertical "more" appears in the lower right corner of the display. This simulate menu will create the same data stored in the DEMO_DATA file on the Utility Disc.

```
Simulate DCE

Block 1                          This program repeatedly sends the character string
Send  |ABCDEFGHGG|                ABCDEFGH and turns on lead CTS.  CTS appears as a
   and then                      softkey selection if you have an RS-232C pod
Set Lead CTS  On                 connected.  If you don't have an RS-232C/V.24 pod
   and then                      connected,  select a lead other than CTS.
Set Lead CTS  Off
   and then
Goto Block 1
```

If You Have Trouble Entering the Program

If you're having trouble entering the program, here is the procedure.

The softkeys change according to the position of the cursor, so you may see certain softkeys only when the cursor is at the beginning of a line. You can use the MORE key to see other softkeys whenever the small vertical "more" appears in the lower right corner of the display.

1. When the cursor is in the "Simulate DTE/DCE" field, press the **DCE** softkey.

```
Simulate DCE
```

2. The cursor now moves below "Block 1". Press **Send** . The flags and good frame check characters appear automatically because you previously selected "X.25" as the protocol in the setup menu. (In the discussion below "|" denotes a flag, and "GG" denotes a good frame check sequence).

```
Send  |ABCDEFGHGG|
```

4. Type ABCDEFG. Press RTN, or right-cursor to the next line.

```
Send  |ABCDEFGHGG|
```

5. Press **and then** . Press MORE until you see **Set Lead** , and press it.

```
Send  |ABCDEFGHGG|
   and then
Set Lead CTS  Off
```

6. Use the right-arrow key to move the cursor to the field with "Off" and press **On** .

```
Send  |ABCDEFGHGG|
   and then
Set Lead CTS  On
```

7. Press **and then** . Press MORE until you see **Set Lead** , and press it.

```
Send  |ABCDEFGHGG|
   and then
Set Lead CTS  On
   and then
Set Lead CTS  Off
```

8. Use the right-arrow key to move the cursor out of the "Off" field, and press **and then** . Press MORE until you see **Goto Blk** , and press it.

```
Send  |ABCDEFGHGG|
   and then
Set Lead CTS  On
   and then
Set Lead CTS  Off
   and then
Goto Block 1
```

Run the Program

Press EXIT to return to the Top Level Menu. Press **Run Menu** , then **Simulate** . The analyzer begins transmitting the character string, displaying what it is transmitting, and storing it in the buffer. The data appears as if it were coming from the line.

5

Examine Data

- Looking At the Buffer
- Display Formats

Looking At the Buffer

When monitoring on-line or simulating, data is constantly being loaded into the circular buffer. When the buffer is full, the oldest data is overwritten. You can look at the buffer at any time by going to the examine data menu. If you want to look at some buffer data, either load the DEMO_DATA file from the utility disc, or run the simulate program in the simulate chapter.

Moving Around the Buffer

Use **Roll Up**, **Roll Down**, **Next Page**, and **Prev Page** in the examine data menu to see all the data in the buffer.

Character Decoding

Move the cursor through the characters. Each character is decoded in binary, hex, and octal, and its parity bit is displayed at the top of the screen.

Timer and Counter Display

Press **Timer and Cntr**. This shows you the setup and the state of the timers and counters at the end of the run.

Bit Shifting

Note "shift = 0" at the top of the display. The **Bit Shift** softkey appears only when the setup protocol is character oriented. Press MORE to show **Bit Shift** when the setup is a character oriented protocol. You can shift bits up to one less than the size of the data code (e.g., six places in ASCII 7) while observing the change in the characters. This is useful in finding the correct character framing in unknown protocols. Bit shifting does not work on the DEMO_DATA data file, because this data is not character oriented.

Cursor Timing

When you already have events in the buffer and you know where they are, you can use cursor timing to measure the time between events.

If you've loaded the DEMO_DATA file, you can measure the time between the "A" and the "G" in your "ABCDEFGH" character string.

In the examine data menu, move the cursor over "A" and press **Start Time**. Then move the cursor over "G" and press **Stop Time**. At the top of the display, TIME = 52.0 ms +-2%.

Cursor Memory

If the cursor is positioned over a character in the display and you leave the examine data menu and go to another menu, the cursor will be positioned over the same character when you return to the examine data menu. It keeps your place!

Changing the Display Format

You can change the display format in the examine data menu by pressing **Chang Dsply**. The different display formats are shown on the following pages.

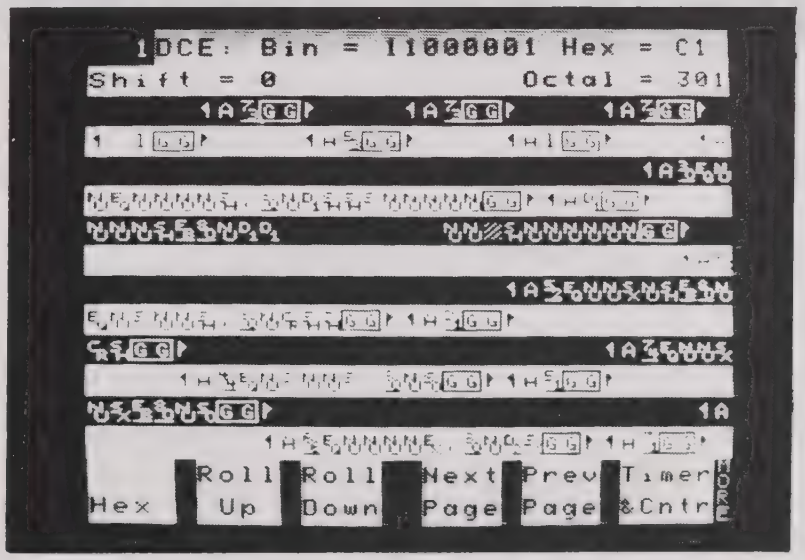


Figure 5-1. Two Line Format

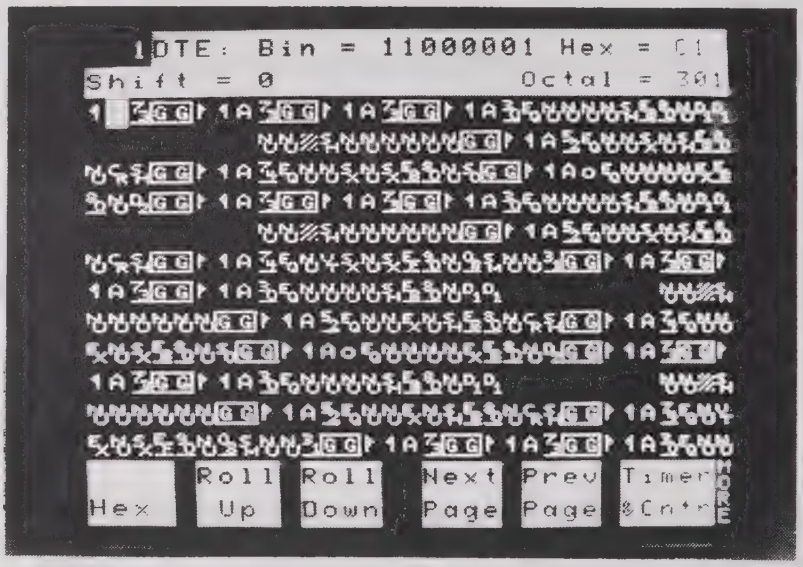


Figure 5-2. DTE Only

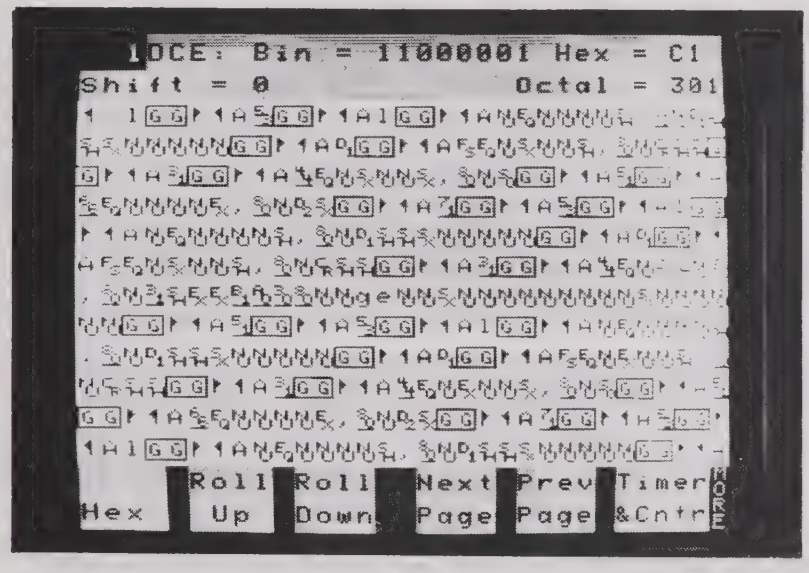


Figure 5-3. DCE Only

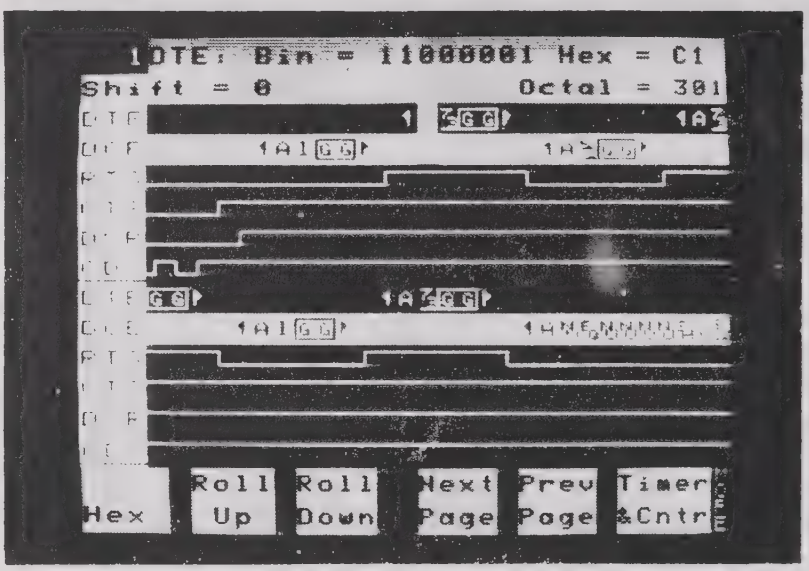


Figure 5-4. Data and State Format

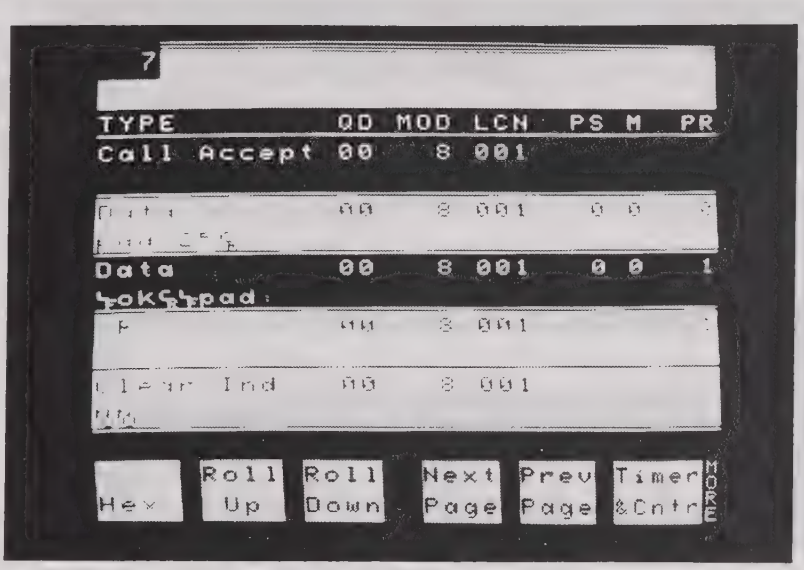


Figure 5-5. Frame Format

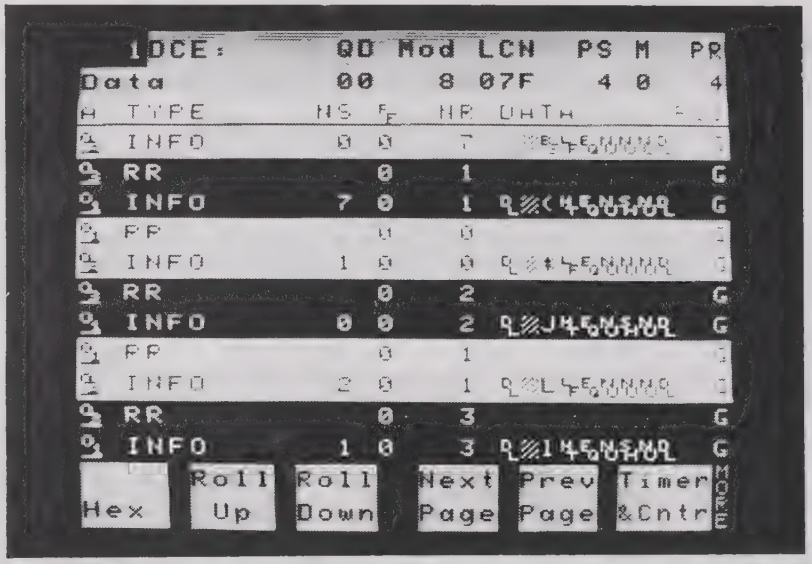


Figure 5-6. Packt Format

6

Disc Operations

- Storing Menus and Data To Disc
- Loading Menus and Data From Disc

Storing Menus and Data To Disc

When you've entered setup, monitor, or simulate menus, or collected buffer data, you can save both the menus and the data on disc.

Type Of Disc

The HP 4952 disc drive requires 3 1/2 inch, double-sided, microfloppy discs. Specify part number HP 92192A to order a box of 10 discs.

Inserting the Disc

Insert the disc with the label side up and the metal shutter pointing towards the drive. Press the disc gently into the slot until you hear a click and the disc is pulled down into the drive.

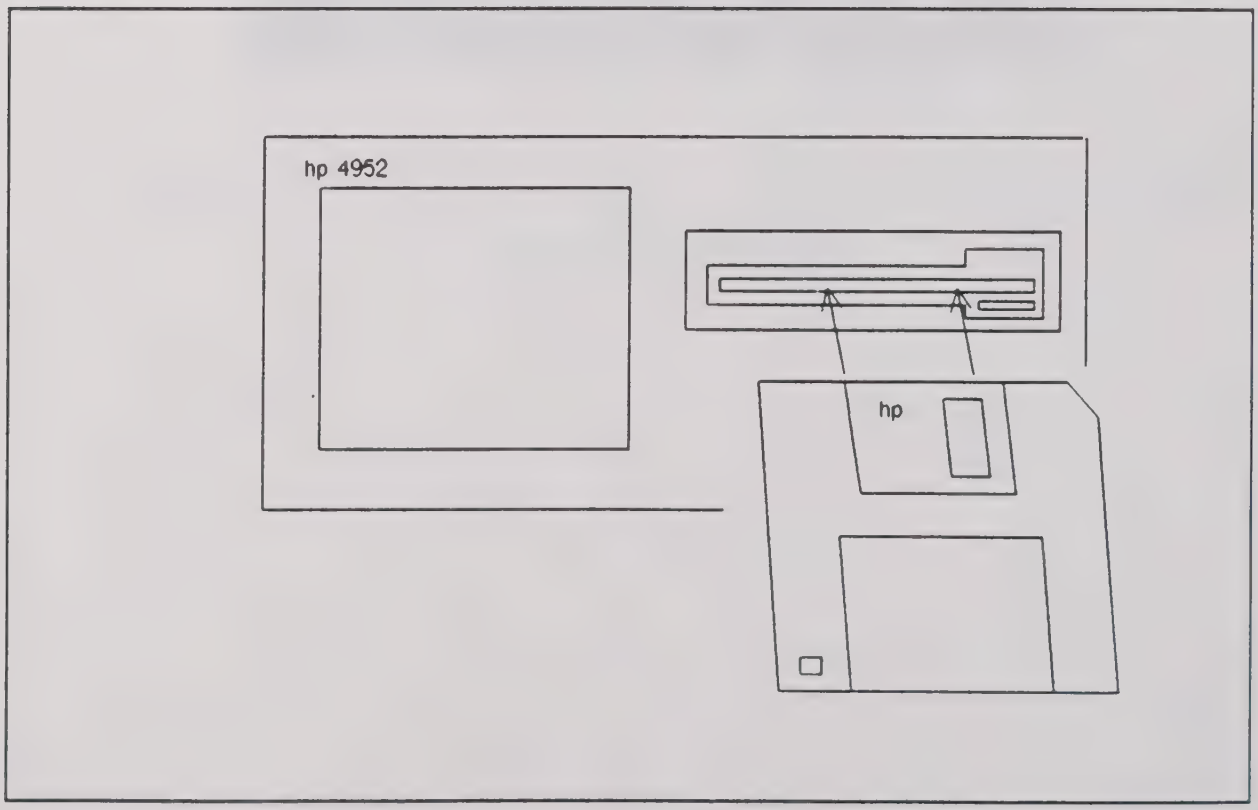


Figure 6-1. Inserting the Disc

Procedure For Storing Files

1. Make sure the disc is not "write protected" (see below). Insert the disc, and press **Mass Store** in the Top Level Menu.

2. If it is a new disc, you must format to create a directory. However, do not press **Format** if there is anything on the disc that you want to save.

3. Press **Store** , and type in the name you want to call the file.

4. Move the cursor to the "file type" field and select the file type from the softkeys. Optionally, type in a comment and press **Execute** .

   If you are performing the examples in this guide, you can save the data you created, as well as your setup, monitor, and, simulate menus in one file by selecting **Menu & Data** as the file type.

Is the Disc Write Protected?

A disc is write-protected when the small tab in the corner is pushed all the way to the edge of the disc. Then no one can write over or delete the information on the disc. You cannot store data to a write-protected disc; but you can load (read) files.

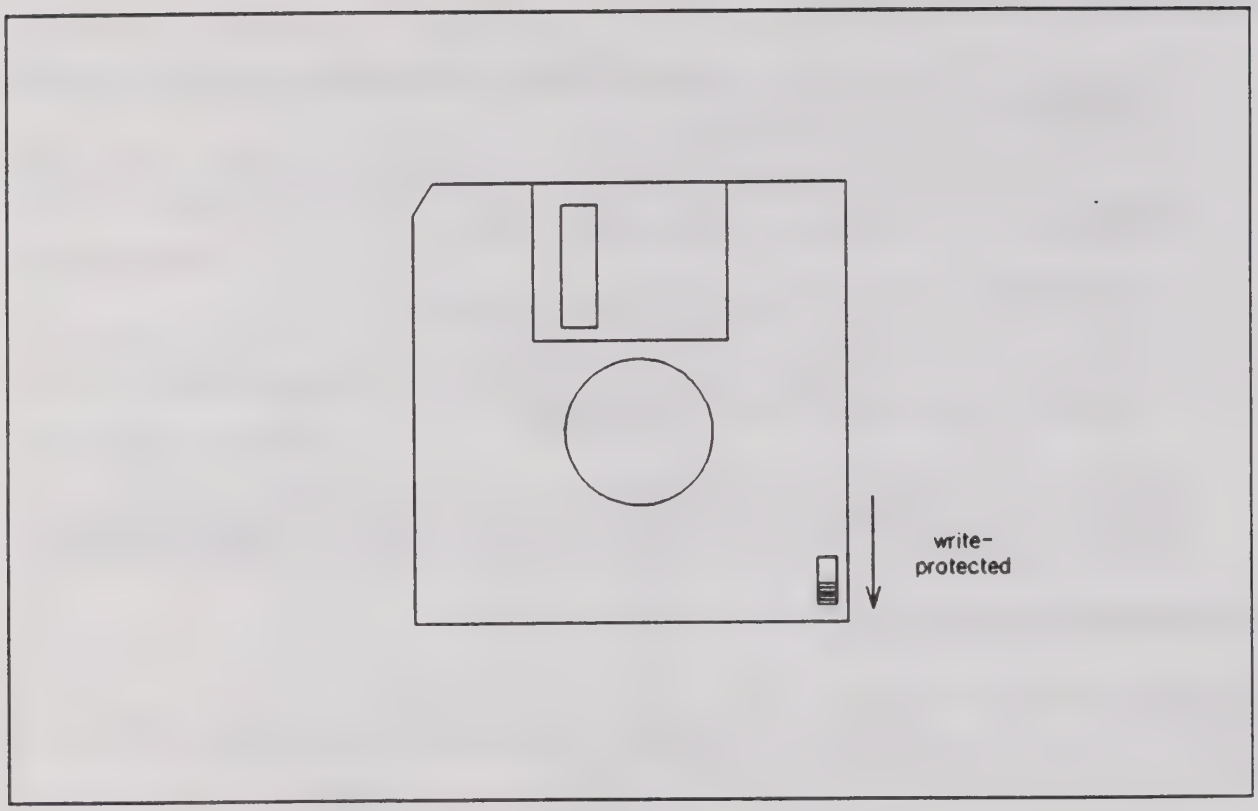


Figure 6-2. Write Protecting Your Disc

Loading Menus and Data From the Disc

If you have a data file on the disc, you can load the data into the analyzer for further study. If the file type is "menu & data", the analyzer will be automatically configured when you load in the file; and you can start looking at the data without having to change the setup.

Procedure

1. Insert the disc with the file to be loaded.

2. Press **Mass Store** in the Top Level Menu. The Directory of files on the disc will appear.

3. Use the up-cursor and down-cursor keys to move the cursor over the file you wish loaded.

4. Press **Load** , and then **Execute** .

Note Always insert the transportation disc when transporting the instrument.

7

BERT

- What Is BERT?
- A BERT Example

What Is BERT?

Bit Error Rate Testing (BERT) checks the integrity of the line by measuring digital noise, i.e., how often a digital high level is incorrectly changed to a digital low level, and vice versa.

BERT Procedure

1. HOOKUP. There are two types of hookup, as illustrated on the following page: end-to-end and loopback. In end-to-end testing, an HP 4952 is substituted for the DTE at both ends of the line. In loopback testing, the HP 4952 is substituted for only one DTE, and the modem or terminal at the other end is looped back.

2. SETUP. Press **BERT** on the Top Level Menu and make the appropriate selections.

```
Pattern:      ____
Block Size:   ____
Duration:     ____
Bits/sec:     ____
Framing:      ____
```

Note Select "Ext" for bits/sec, and "None" for framing on synchronous systems.

3. EXECUTION. Press **Run Menu** in the Top Level Menu, and then **BERT** . The HP 4952 begins transmitting and receiving, and a data screen shows test status. Press EXIT to halt.

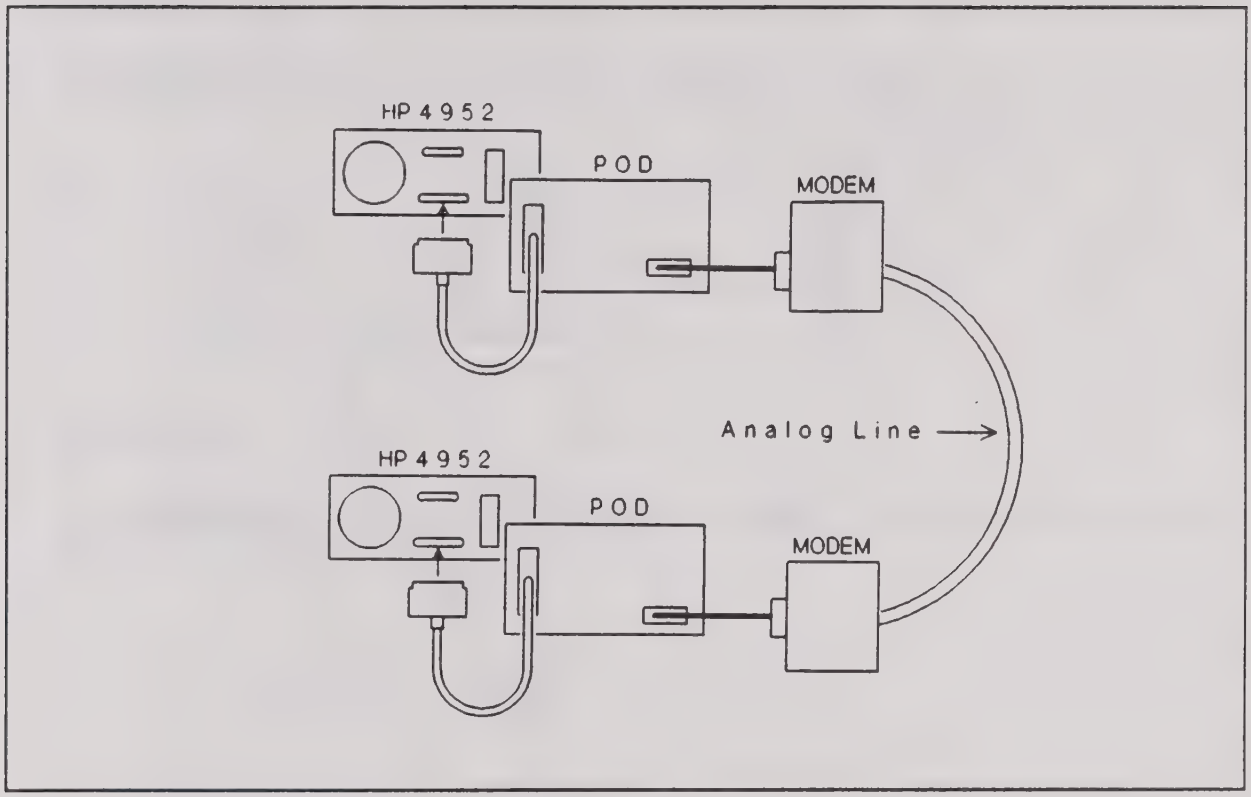


Figure 7-1. End-to-End Hookup

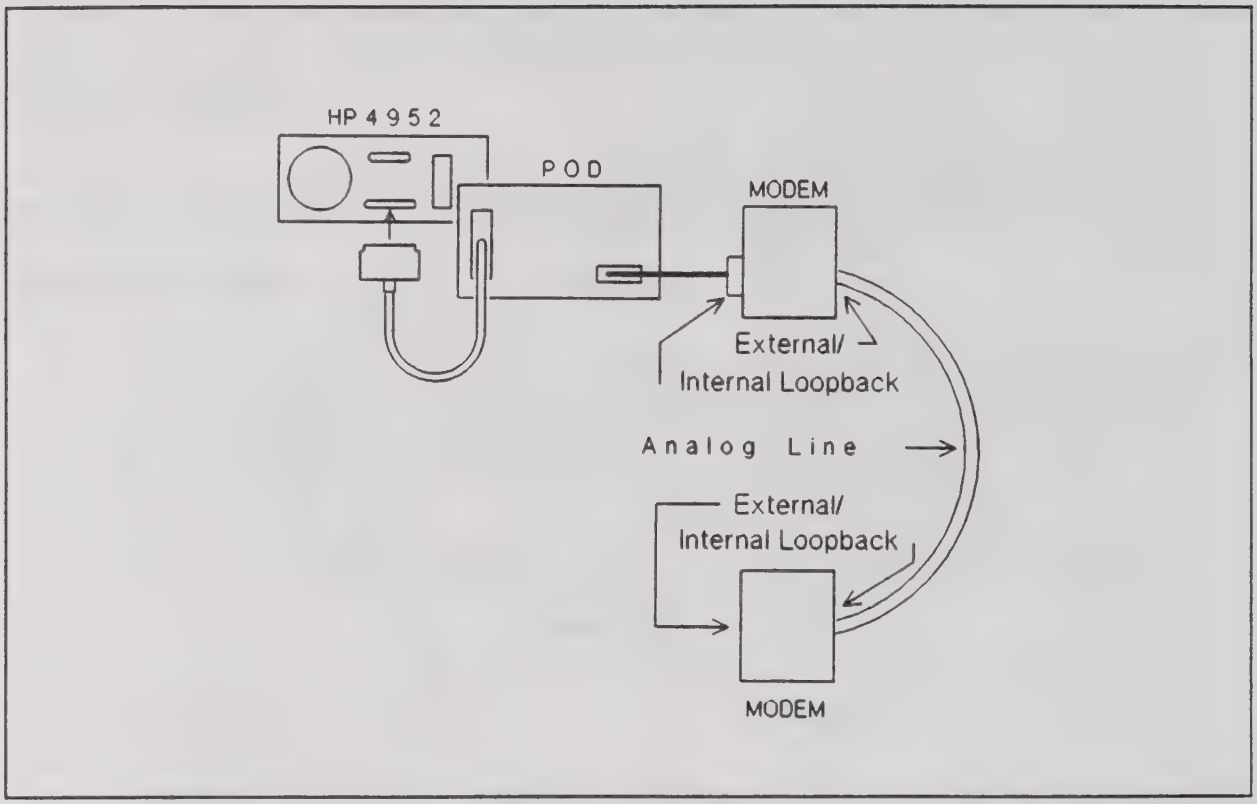


Figure 7-2. Loopback Hookup

A BERT Example

The following example allows you to run a BERT test without connecting to the line.

Hookup

Connect the pod to the analyzer and jumper the DTE and DCE pins (2 and 3 on the RS-232C/V.24 pod). The analyzer is a DTE during BERT testing, which means that it transmits on pin 2 and receives on pin 3. Thus, you are making it appear to the analyzer that its DCE line is connected.

Setup

Press **BERT** in the Top Level Menu, and enter the following parameters:

Pattern:	511
Block Size:	1000 bits
Duration:	5 Minutes
Bits/sec:	1200
Framing:	None

Execution

Press **Run Menu** in the Top Level Menu, and then **BERT**. The following run-time data screen should appear:

Elapsed Seconds :	___
Errored Seconds:	___
Block Count:	___
Block Errors:	___
Bit Count:	___
Bit Errors:	___

Injecting Errors

To check your setup and connections at any time, you can press **Inject Error** or **Inject 10 Err**. The "bit errors", "block errors", and "errored seconds" should all change. If you press **Inject 10 Err**, the "bit errors" will increase by 10, and the "block errors" will increase by 1.

Setup Summary

Press **Summary** to see the BERT setup during execution. Then press **Data Disp** to go back to the run-time data screen.

8

Examples

- Measuring a Single RTS-CTS Delay
- Monitoring a DCE
- Monitoring a DTE
- Sending the Fox Message
- Counting Parity Errors

Example 1: Measuring a Single RTS-CTS Delay

This test measures the time from when RTS goes on until CTS goes on. Use the **Monitor** menu for this example.

To view the timers and counters, press **Summary** during run-time, or **Timer & Cntr** in the Examine Data Menu after run-time.

Note that timer measurements must be referenced to a preceding trigger for accurate measurements.

Program	Description
Block 1: When Lead RTS goes On then goto Block 2	
Block 2: Start Timer 1	Timer 1 indicates RTS-CTS delay.
When Lead CTS goes On then goto Block 3	Note that Start and Stop statements must be preceded by When statements for accurate timing.
Block 3: Stop Tests	

Example 2: Monitoring a DCE

In this example, you monitor a DCE by simulating the DTE through the **Simulate** menu. When simulating a DTE, the HP 4952A supplies the ETC clock. Upon receiving the proper clocks and lead commands, the DCE begins sending data, which the HP 4952A automatically stores and displays while in the simulate mode.

```
Simulate DTE

Block 1:
Set Lead DTR  On
   and then
Set Lead RTS  On
```

Example 3: Monitoring a DTE

In this example, you monitor a DTE by simulating a DCE. When simulating a DCE, the HP 4952A automatically supplies both the TC and RC clocks. Upon receiving the proper clocks and lead commands, the DTE begins sending data, which the HP 4952A automatically stores and displays while in the simulate mode.

```
Simulate DCE

Block 1:
Set Lead DSR  On
   and then
Set Lead CD  On
   and then
Set Lead CTS On
```

Example 4: FOX Message

This test checks the ability of asynchronous terminals and printers to receive and display data. The "FOX" message is transmitted to the terminal using the **Simulate** menu and then the echo from the terminal is checked for parity errors.

```
Simulate DCE

Block 1:
Send THE QUICK BROWN FOX
JUMPS OVER A LAZY DOG 012
3456789.

Block 2:
When Error Parity on DTE
   then goto Block 3
When DCE
   then goto Block 1

Block 3:
Increment Counter 1
   and then
Goto Block 2
```

Example 5: Counting Parity Errors

This program uses the **Monitor** menu to count the number of parity errors on both the DTE and DCE lines and keep track of the number of minutes of the test.

Program	Description
Block 1: When DTE X or When DCE X then goto Block 2	Timer 5 starts when any character is sent on the DTE or DCE line. ("X" = don't care.)
Block 2: Start Timer 5	Timer 5 counts milliseconds up to one minute.
Block 3: When Error Parity on DTE then goto Block 4 When Error Parity on DCE then goto Block 5 When Timer 5 is > 59999 then goto Block 6	
Block 4: Increment Counter 1 and then Goto Block 3	Counter 1 indicates DTE errors.
Block 5: Increment Counter 2 and then Goto Block 3	Counter 2 indicates DCE errors.
Block 6: Increment Counter 5 and then Reset Timer 5 and then Goto Block 2	Counter 5 keeps track of the number of minutes into the number of minutes into the test.

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